

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

Telephone: CENTRAL 3212 (10 lines)

BIRMINGHAM: Daimler House, Paradise Street, (Midland 0784-5)

Telephone: CENTRAL 3212 (10 lines)

VOL. XLV. NO. 1152

July 26, 1941

Annual Subscription, 21s.
Overseas, 26s.

The Central Register

THE use made in war of those possessing technical qualifications is the cause of considerable criticism. The Government, we are told, has not employed technical men for research work and in the development of machines of war only because "the proposal to include representatives of applied science did not fit into the scheme of the Scientific Advisory Committee as the Government conceived it." Upon the same occasion Lord Hankey mentioned with approval "the invaluable work of the Central Register . . . of persons with scientific, professional and high administrative qualifications," and congratulated all concerned on having "built up a very comprehensive Register."

Undoubtedly a very comprehensive Register has been built up. Some 200,000 names are on that Register, but from it only some 13,000 persons (6.5 per cent.) have been placed in work of national importance, and that after nearly two years of war! Criticisms of the Central Register are heard on every side. It is complained that Government Departments do not make use of the Register when they require senior staffs. Many of those on the Central Register are desperately anxious to do work of national importance. They are not unemployed men and women seeking a job; they are frequently retired or doing work that is not essential, and they would like their services to be utilised, regardless of salary, in the national effort. This is not the place to register individual complaints, but it would be interesting to know the total of the positions, filled since the start of the war, which required persons with scientific, professional, and high administrative qualifications; also how many of these have been obtained through the Central Register. Since the Central Register is supposed to include all the people in the country with these qualifications, and since only 13,000 have been taken off the Register, the answer should be particularly illuminating.

The Chairman of the Central Register, Sir Walter Moberly, has explained that the Register is not an employment agency designed to assist people in need of work to get it. No one who has endeavoured to obtain work through the Central Register could ever fall into that delusion. The work of the Register has been criticised on the ground that, according to its original scheme, those on the National Register were to be available for work of national importance *if they were not already so employed*, whereas in practice instead of drawing upon such reserve talent, the Register has offered to employees already engaged upon the national war effort posts in Government De-

partments at salaries in excess of their value without regard to their suitability. Our own experience has been just the reverse.

It is surely obvious by now that the Central Register *as now operated* is an outstanding failure. It has not provided work for those who desired that their services should be utilised; it has offered work to those who are not available to take it; it has offered unsuitable work; and it has not supplied the men required by the Government Departments, for whose benefit it was presumably created in the first place. The Register itself is good. It contains the technical records of 200,000 men and women carefully compiled at considerable labour by themselves. The working of the Register must be drastically overhauled, since at present it is an outstanding example of the Englishman's genius for muddling. Why have round pegs so generally been brought in contact with square holes? Why have so many pegs been offered no holes at all? Is it not because the officials responsible for the Register have failed in their duty of classifying adequately the information given to them? This classification must be undertaken forthwith if the technical effort of the nation is to be first-class.

The first step in classification might be to analyse the Register in order to select a few hundred men possessing outstanding qualifications and to discover those of them who could be moved, if needed, on the principle that a man must not be moved unless he can better assist the nation in his new post. The next step might be to differentiate between those in less important posts who are already usefully employed in the war effort and those who are engaged in less essential industries. This group should be further subdivided by listing those who have expressed a desire to enter Government service and to obtain from each one a statement of the conditions upon which he would be willing to do so. We do not suggest that this classification is the best, but it would at least enable key men suitable for high positions to be discovered; it would prevent men already doing good work from being taken from it; and it would enable the first chance to be given, other things being equal, to those enthusiastic enough to press for employment in the war effort. We cannot believe that if those in charge of the Register made proper use of the information at their disposal, it could not even now be made an instrument of value instead of a laughing stock. We want no more self-satisfied statements as to the value of this Register. This is a war of technicians; it is time that we mobilised our technical men and women to fight it.

NOTES AND COMMENTS

The Location of Industry

THOSE who heard Lord Reith speak at the recent luncheon of the Institution of Chemical Engineers on the subject of post-war planning will be particularly interested in the statement upon the Government policy in the planning of reconstruction and development which he made in the House of Lords last week. The Government have accepted the view that "all necessary preliminary steps towards the working out of a national plan should be taken as soon as possible." Frankly, we have little sympathy with the view that because our first task is to win the war, post-war reconstruction should wait until that has been done. Winning the war is not the only objective for which we must work. All industrialists, in whatever field they may operate, have the same responsibility for winning the subsequent peace as our service commanders have for winning the war. There is a passage in Dorothy Sayers' book, "Begin Here," which seems to us to contain a good deal of wisdom. "There is a very natural tendency to say, 'We can't do anything now. When the war is over it will be time to begin.' That will not do; indeed, it is not too much to say that whoever wins the war, the peace will be won by those who, throughout the struggle, remained alert and ready with a clear idea of what they want. . . . For war is an opportunity. . . . War means that we cannot return to the past. Nor can we sit still. So we must go forward."

Effect of Planning on Industry

THE effect of planned reconstruction on industry cannot be visualised clearly until the plans made by the Government are published. Undoubtedly, the end of the war will see general demands from reformers of all sorts for physical reconstruction in the rebuilding of areas damaged seriously by enemy attack, and also of industrial reconstruction in the better utilisation of manpower, machinery, leisure, and raw materials. The present measures appear to be no more than designed to plan building reconstruction. It can be expected that among other projects will be the location of industry in country districts. This in itself will cause a great deal of new work in the maintenance of public utility services to these more distant industrial districts. It may be that any such schemes for the redistribution of industry will fail on account of the expense and inconvenience entailed. But it may also prove in the long run that this expense is justified. There are in England a very large number of works—perhaps the majority of works—which have grown up little by little as demand has increased and in consequence are not laid out with any real plan. These works are inconvenient, more costly to operate than they should be and contain a good deal of obsolete plant which is working under bad conditions. It would be no inconsiderable contribution to the future prosperity of the country if the majority of our works were caused to start again on a fresh site, giving them an opportunity for a proper flow of materials through the works and for scrapping obsolete plant. Probably the cost of doing this in comparison to the cost of the war would be negligible and, unlike war, such expense would yield sound financial returns.

A Chemical Use for Coal Refuse

THE large pithead dumps that are a familiar sight in colliery districts present a challenge to the industrial chemist. At great labour and cost this material has been mined from the earth and has then been separated from the coal with which it was mixed. It comprises large pieces of slate, high-ash bone coal, clay, and the finer washery refuse. Attempts have been made to utilise it as a surfacing agent on rough roads round mining towns, and it has found a limited use for filling up spaces on the railway, but all these applications are made on the basis that it is worthless. It is difficult to see what use could be made for the true stone, the heavy

material above about 1.8-2.0 sp. gr. The U.S. Bureau of Mines in their Investigation Report 3548 suggest that the lighter part of this refuse contains enough carbon to enable it to be converted into active carbon for water purification, particularly for the removal of tastes and odours from municipal water supplies. The activated carbon industry is already highly developed and uses a wide variety of raw materials such as lignite, paper-mill waste, wood, bagasse, nut shells, coal, sawdust, sugar, rice hulls, cotton seed hulls and straw. The experiments of the Bureau suggest that the coal should first be carbonised at a low temperature (below 500° C.); it should then be ground to a fine powder passing 325 mesh and should be activated by treatment with steam at temperatures between 700° and 950° C. In such circumstances a considerable proportion of the pithead dumps could be utilised for this special purpose. It will not be forgotten that at the outbreak of war the Fuel Research Station in London investigated the production of active carbon from British coals, and concluded that non-coking coals provide the best material for the purpose. With the present shortage of wood the production of active carbon from non-coking coal might well become of industrial importance, particularly if it could be obtained by utilising a proportion of the refuse.

Defeating Absenteeism

THE Select Committee on National Expenditure state in their 17th report that filling factories are more seriously affected by absenteeism than ordinary engineering works. This conclusion is reached after a sub-committee had visited two filling factories where the absence of workers was causing serious disruption, because many of the operations take place in small shops and much of the work is done by hand. Absenteeism during the winter months varied between 15 per cent. and 20 per cent. This dropped to 10 per cent. when a three-shift system of work was adopted and rose later to 12 per cent. Saturday afternoon and Sunday morning are the worst periods for absenteeism. Reviewing the reasons for these high figures, the sub-committee finds that inadequate transports arrangements have been made for the workers, some of whom travel 30 miles and most three or four miles in order to reach their work. The sub-committee contends that it is unfair to expect punctuality or regular attendance in such circumstances. They recommend the provision of sufficient hostel accommodation near the factories, a careful check of canteen arrangements and prices, and the shortening of the seven-day week. Except for maintenance duty, it is considered that Sunday work should take place only in real emergencies, though the committee admits that if a six-day week became general, wages would possibly have to be adjusted to conform with present levels.

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Water-Glass: its Composition and Uses

II.—Notes on Analysis and Manufacture

by BRUNO SCHWEIG, Ph.D.

(Continued from "The Chemical Age," July 19, 1941, p. 37)

THE physical and chemical properties of the solid water-glasses resemble those of the glasses with a low content of alkaline earth metals. Well melted water-glasses look very like greenish or yellow bottle-glass. They have the same density, the same lustre, fracture in the same mussel-shaped way, have the same refractive index, hardness, brittleness and elasticity, equal sensitiveness to rapid changes of temperature, and exhibit slow softening with increase of temperature instead of sudden melting; in short, they behave like genuine glasses. The viscosity of solid water-glass is characteristic. It increases quickly with the augmentation of the silica content. Water-glass of 70 per cent. SiO_2 is, at all temperatures, about four times as viscous as that of 60 per cent. SiO_2 . Potassium water-glass is much more viscous than sodium water-glass of the same molecular ratio.

The one fundamental difference between water-glass and ordinary glass is its solubility in water. It is possible to make solutions containing 30-60 per cent. of solid glass. Therefore, water-glass is highly soluble, but it is not easily soluble if, by that, quick solubility is understood. On the contrary, water-glass dissolves only very slowly; so slowly, indeed, that lumps of water-glass even if in contact with water for several days, lose hardly any of their weight. Therefore, solid water-glass in big lumps can be transported in open waggons. Water-glass is also tasteless, either in small lumps or freshly pulverised, though even very dilute solutions show a distinctly alkaline taste. It takes hours to dissolve only a few per cent. of finely pulverised water-glass, regardless of whether cold or warm water is used. At 100°C . the solution can be accomplished only under special conditions. At $140^\circ\text{--}160^\circ\text{C}$., however, under pressure in an autoclave, even big lumps are completely dissolved relatively quickly. It seems that the process of solution is different from that of other materials; it is possibly of a physico-chemical nature and not yet completely known.

Unsuitable Sands

The solubility is greatly impeded if earthy impurities be present, so that sands containing mica, felspar, lime, clay, iron oxides, etc., are not suited to making water-glass. When a water-glass containing these impurities is treated with boiling water, earths and metal oxide may be left as an insoluble sediment. Some foreign matter may be dissolved, because the solution of water-glass can dissolve traces of most oxides, and the solvent power increases with the concentration of the solution. Hence a solution which is slightly turbid when diluted becomes clear by concentration, and conversely. Even the oxides of calcium, barium, and magnesium are slightly soluble in water-glass liquor. When a few drops of diluted solution of a metallic salt are added to water-glass, the precipitate first formed will generally disappear when the mixture is agitated. Consequently liquor silicum may dissolve appreciable amounts of oxides of iron, zinc, manganese, tin, lead, copper and mercury.

The speed of solution is greater when a small amount of water is used than when using larger quantities. This surprising observation is explained by the fact that a thin film of silicic acid is formed on the surface of water-glass, if it is attacked by water or an acid liquid. The silica film protects the water-glass from further attack, but easily dissolves in alkali, or in a solution of water-glass which is itself alkaline. It is therefore preferable to dissolve solid water-glass in weak solutions of water-glass instead of in pure water.

Liquid water-glasses are of a colloidal nature, characterised by their incapability to crystallise, their high viscosity, and the ability to form gelatinous precipitates. It is,

however, possible to obtain crystallised alkali silicate from strongly alkaline solutions. Usually metasilicate, $\text{Na}_2\text{SiO}_3 \cdot 9\text{H}_2\text{O}$, m.p. 47°C ., crystallises in rhombic particles. Sometimes metasilicates with less water, e.g., $\text{Na}_2\text{SiO}_3 \cdot 6\text{H}_2\text{O}$ (monoclinic, m.p. 62°C .) and $\text{Na}_2\text{SiO}_3 \cdot 4\text{H}_2\text{O}$ (hexagonal, m.p. 85°C .), are formed. These metasilicates with the molecular ratio $n = 1$ are not genuine water-glasses, as their nature is different from that of a non-crystallisable glass. Free of water, metasilicate melts at 1080°C . It crystallises so easily that it cannot be obtained as a glass in quantities above an ounce.

Stirring Essential

Evaporating water-glass without stirring leads to the formation of a transparent film on the surface and on the walls of the container. This hinders the conduction of heat and must be prevented by strong agitation. Water-glass if carefully evaporated, avoiding bubbles (by heating for instance on the water-bath), leaves a hard, glassy mass. It is always soluble in hot water or in sodium carbonate provided that it is not decomposed by the carbon dioxide of the air. Films of water-glass, even if apparently dry and impervious, are still capable of absorbing water and exuding it elsewhere. It is, therefore, not an absolute protection against drying up like an oil or wax film, but only prolongs the drying process.

Strong boiling of water-glass solutions with the formation of steam bubbles soon leads to ebullition and eventually produces large quantities of snow-white, fine-meshed foam which becomes solid on cooling. Solutions of water-glass, if exposed to the cold, do not change substantially. The viscosity increases considerably; at -3° to -5°C . the solutions become turbid through the formation of crystals or flakes but the original state is re-established on warming.

If water-glass is preserved in glass bottles, the viscosity often increases, though it remains constant when the material is stored in iron vessels. Probably some of the glass from the bottles enters and causes the increase in viscosity.

The boiling point of water-glass solutions of 38°Bé is 100.4°C ., that of a 60°Bé "alkaline" solution 104.7° , and increases to 112°C . in a 58°Bé solution of Na_2SiO_3 . All solutions of water-glass are alkaline. Yet water-glass of the constitution $\text{Na}_2\text{O} \cdot 3.3\text{SiO}_2$ is often called "neutral" or "acid," whereas $\text{Na}_2\text{O} \cdot 2\text{SiO}_2$ is marked "alkaline" by convention.

The trade, as a rule, distinguishes between "water-glass," having the molecular ratio $\text{Na}_2\text{O}:\text{SiO}_2$ from 1.2 up to 4 molecules SiO_2 , and "meta-silicate," with a ratio 1:1, corresponding to the formula $\text{Na}_2\text{SiO}_3 + \text{aq}$. Of these last only $\text{Na}_2\text{SiO}_3 \cdot 9\text{H}_2\text{O}$ is of technical importance.

From an industrial point of view, the soluble silicates are those of sodium and potassium, although all the alkali metals form silicates soluble in water, and even ammonia affects the solubility of silica. Because of their lower cost the sodium compounds are used in amounts compared with which the uses of potassium silicates are insignificant, though in a few cases the advantages of potassium silicate give them a place.

The various applications of water-glass turn on its adhesiveness in the hydrated state, its vitrifying power in the dry state, its alkalinity, its capability of yielding soluble silica, and its peculiar chemical properties as a whole. A British manufacturer of silicate of soda recommends it in his advertisements for use in the laundry and textile industries, paper-mills, and dairies, and for metal cleaning and proprietary articles. A broad survey indicates that about one-fifth of the total production is used in the soap and cleaning industry, one-fifth in the textile industry, two-

fifths in paper-mills and the one-fifth for all other purposes. In war time, of course, these proportions are altered, and one-third or more of the water-glass produced goes into the soap industry.

Fireproofing, which normally absorbs only a minor part of the soluble silicates, becomes one of their most conspicuous applications in war time. The writer's article on "Fireproofing, the First Step to Fire Prevention," in the *A.R.P. Review* of April, 1941, deals at greater length with this. The idea is to deposit minute crystals in the pores of the combustible material, closing them with a non-flammable substance, and thereby preventing access of air. One of the most suitable solutions for this purpose is water-glass. Several other substances can also be used but hardly any of them, with the exception of common lime-wash is so easily obtainable in war time.

Egg-preserving is one of the minor uses for water-glass, though, perhaps, the most familiar to the general public. If done in the right way, silicate storages gives eggs which

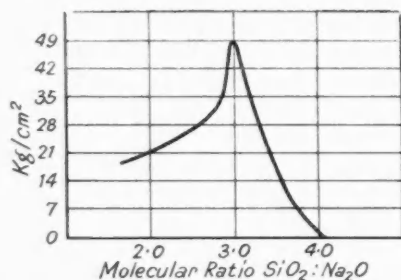


Fig. 3. Adhesive power of water-glass in relation to molecular ratio, measured by the shearing strength of cemented walnut. (McBain and Hopkins)

at the end of six months can hardly be distinguished from fresh ones.

The soap industry in time of war habitually has recourse to water-glass, so that a substantial increase in the use of water-glass can confidently be expected. The employment of water-glass in the soap industry has, however, also obtained a strong foothold in peace time. The amount put into twenty brands of laundry soap sold on the American market in 1922 averaged about 12 per cent, anhydrous silicate in the finished soap, and ranged from 1 to nearly 25 per cent. In other countries the conditions are similar, and in Germany before the outbreak of the war it was compulsory to add 20 per cent, of water-glass to all soap manufactured. The water-glass not only replaces and saves fat, but in some respects also improves the quality of the soap. As a detergent sodium silicate is regularly used, either alone or in compounds, wherever an inorganic cleaning material is required. Its power of deflocculation, wetting, emulsifying, and of increasing and stabilising foam, as well as precipitating calcium and magnesium from hard water, and preserving bleaching compounds, etc., makes it an almost indispensable cheap all-round cleansing agent.

The adhesive properties of liquid water-glass are similar to those of many organic colloids. Water-glass has, moreover, several advantages. It is odourless, heat-proof, and vermin-repellent, cannot rot, inhibits the growth of fungus, and becomes eventually insoluble. Here, again, it is used pure or in mixtures with starch, glue, casein, etc. It is especially employed as adhesive in the manufacture of cardboard and corrugated paper. Plywood and ceramic articles are likewise often cemented with water-glass. Fig. 3 shows how the adhesive strength varies with the molecular ratio $\text{Na}_2\text{O}:\text{SiO}_2$, and that it is all-important to keep the ratio as near as possible to three.

Cements for various purposes are made from water-glass. Fireproof lutings for jointing firebricks, mixtures of water-glass and fibrous asbestos, and water-glass with clay, sand, or concrete are some of the applications. Its cementing properties are made use of in the manufacture of artificial

stone, e.g., by the Ransome process of mixing sand with a solution of water-glass, and when dry soaking it in a bath of chloride of calcium, forming eventually an insoluble calcium silicate. As a binder in the carbons used as electrodes in arc lamps, potassium silicate is preferred because of the colour of the flames, which would be too yellow with sodium water-glass.

The textile industry makes extensive use of water-glass in different ways. It is employed especially for washing and bleaching; for weighting, especially in the silk industry; as a mordant and fixing agent for dyeing and printing; for sizing and finishing; for mercerising; for degumming silk; and for fire-proofing fabric.

Most interesting and important of these is the use of water-glass for silk weighting. Although recently advertisements have appeared in which the advantages of weighted silk are set forth, it seems dubious whether the weighting really means an improvement in quality, but it lowers the cost and strengthens the fibre. The fact remains that most silk is weighted, and that from 40 to 75 per cent, of the weighting is done with minerals of which 40 per cent, may be silica. Thus, for instance, the U.S.A. consumed in 1922 approximately 6,250 tons of water-glass for silk weighting. As a fixing agent silicate solutions are effective for iron and chromium salts used as mordants, especially the arsenates and phosphates which are rendered insoluble in a bath of one of the more siliceous grades.

The manufacture of water-glass and all silicates of the type Na_2O , $n\text{SiO}_2$ turns, of course, on the problems of uniting the two constituents, sodium oxide and silicic acid, in the desired proportion, using the cheapest raw materials available and the method best suited for the purpose.

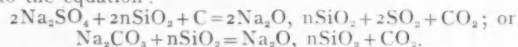
For Na_2O the raw materials are obviously caustic soda, NaOH , or the sodium salts, Na_2CO_3 , Na_2SO_4 , NaNO_3 , Na_2S , and even common salt, NaCl , all of which can be reduced to Na_2O . Silica, is available either as sand or as infusorial earth (kieselguhr), flint, as amorphous silicic acid (obtained as by-product from other processes), and in compounds such as ferro-silicon and mangano-silicon; also in charred organic substances.

Fundamentally, the same processes are in use for the combination of these materials as those which the original industrial pioneers suggested and used. It seems to be a law of technical development that once an invention or innovation has reached a certain stage of perfection, it remains essentially in this quasi-classical state for a long time, perhaps for centuries, before a change occurs. This may be an encouragement for inventors whose good ideas are not easily superseded.

Original Process Most Important

Thus, the original dry process of producing water-glass is still the most important one and the one used almost exclusively on an industrial scale. About 75 parts salt-cake (sodium sulphate), 8 parts coal, and 100 parts powdered quartz sand or flint are fused at $1300^\circ\text{--}1500^\circ\text{C}$. in a furnace for about 8-10 hours. When using soda ash (sodium carbonate) instead of the sulphate, about 55 parts soda ash are mixed with 100 parts sand. Sometimes a little coal (about 2 parts) is added to facilitate the fusion, and to increase the fusibility of the alkali and silica a little borax is often employed in the mixture.

The fundamental reaction is assumed to be according to the equation:



It may be said that in the sulphate process as much as twice the amount of carbon stated in the formula can be used without yielding sulphides in the final product. It is, however, recommended to use a little less than the formula postulates. If too much is used, a dark amber-coloured glass, containing sulphides and colloidal carbon, will result. A deficiency in carbon will leave Na_2SO_4 in the glass, an alternative usually accepted in practice.

Fusion of sodium or potassium carbonates with silica is perhaps the most important means of preparing alkali metal silicates. The raw materials are available in a high state of purity, they react at temperatures compatible with

onomical furnace operation, and the process lends itself to accurate technical control and yields neither offensive nor troublesome by-products.

For potassium carbonates the aforementioned carbonate equation, correspondingly altered, is valid. About 60 parts of potassium carbonate are required for 100 parts of sand and coal generally added amounts up to 6 parts.

The manufacture of a glass of accurate composition by the sulphate process is more difficult than with the carbonate method, and in the U.S. it is not used for grades in which a high degree of purity is important. It is, however, nearly exclusively used for neutral glasses, where it is often preferred, e.g., in Germany, because of its lower cost. On the other hand, its employment involves the loss of sulphuric acid, for which reason the exclusive use of the carbonate for the whole water-glass industry is often demanded. The disposal of large quantities of sulphur dioxide may create another problem, but the rate of the reaction is such that in most localities a high chimney is sufficient to disperse the gas at dilutions which are not harmful to adjacent vegetation. Moreover, even with the addition of coal, about 10 per cent. more heat is necessary to decompose the sulphate than the carbonate.

The chief development in recent years in water-glass manufacture has been in the design of furnaces. They now operate much more economically and yield more uniform and better products at a lower cost. The open-hearth regenerative type of furnace is most widely used, although satisfactory results are also obtained from reverberatory furnaces in which coal is burned on a grate, and from furnaces heated with mineral oil. Electric furnaces are now used.

The silicate furnace differs from the glass furnace in that it is not essential for it to deliver an absolutely homogeneous product. Fine striations in the glass, representing slight variations in composition, seem to increase rather than retard the rate of solution.

A modern furnace has a capacity of up to 50 tons and when continually working needs about 230 kg. fuel, of 7000 calories per kg. per ton of fused material. But even a consumption of 560 kg. of fuel of 5000 calories per kg. is considered as moderate in average work.

Effects of Furnace Temperatures

The most suitable furnace temperature is 1400-1500° C. For alkaline glasses 1300-1400° C. is sufficient. The lower the temperature, the slower is the reaction. At high temperatures the attack on the refractory materials is very severe, especially at the level of the liquid glass. A certain proportion of the refractories which as a rule consist of fire-clay always goes into solution. The melt contains so much silica that it readily attacks any basic refractory, and the equilibrium between silica and soda is such that highly siliceous refractories fail almost equally rapidly. The heating gases carrying sulphuric or sulphurous gases contribute to the destruction. The furnace life is short and there is, therefore, a great deal of room for the development of clay refractories less susceptible to solution in silicate glasses than those at present available.

Water-glass can, of course, conveniently be melted in electric furnaces of either the arc or the conduction type.

Plants of this type are therefore erected where water-power provides electricity at a low price. At Niagara the first electric plant was started at the end of 1932 and has been operating continuously. The produced sodium silicate is of the formula $\text{Na}_2\text{O}, 3.265 \text{ SiO}_2$. Its purity is remarkable, the approximate analysis being:

Na_2O}	...	...	...	23.24%
SiO_2	...	...	...	75.89%
Fe_2O_3	...	...	...	0.043%
Al_2O_3	...	...	...	0.195%
CaO}	...	...	...	0.069%
MgO}	...	...	...	0.069%
TiO_2	...	...	...	0.01%

The initial difficulties in finding electrodes which would not dissolve, and so discolour the molten glass, were overcome by substituting very pure iron electrodes for the graphite ones originally used. The problem of refractories is still serious at the high temperatures employed.

(To be continued.)

Textile Finishing Agents

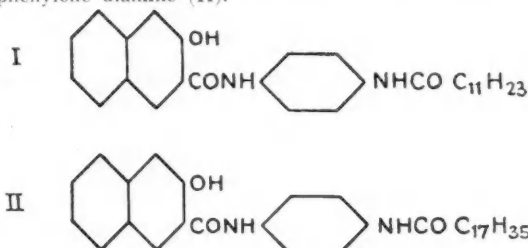
Dyestuffs of the Naphthol A S Group

It is readily understandable that the production of dyestuffs capable of functioning as textile finishing agents should attract the attention of research workers. Some recent work in this field by Rath and Burkhardt, at the Stuttgart Textile Research Institute, has been described in *Berichte* (1940, 73, pp. 701-8), and is worthy of notice even though the results were not altogether satisfactory.

Dyestuffs of the naphthol A S group were selected for the investigation, the object being to introduce long-chain fatty acid radicals into the molecule of the azo compound since it is well known that such radicals improve the handle of textile fibres.

Synthesis of the new dyestuffs was approached from two angles: (a) from that of replacing the aniline residue in the well-known [2-oxynaphthoic acid-(3)]-anilide (naphthol A S) by higher fatty acid radicals; (b) from that of introducing the same radicals into amines suitable for coupling.

(a) The condensation 2-oxynaphthoic acid-(3)-chloride with N-lauryl-*p*-phenylene diamine or N-stearyl-*p*-phenylene diamine in pyridine solution yielded respectively N-lauryl-N'-[2-oxynaphthoyl-(3)]-*p*-phenylene diamine (I) and N-stearyl-N'-[2-oxynaphthoyl-(3)]-*p*-phenylene diamine (II).



In next attempting to couple these intermediates with diazonium salts under conditions which would satisfy normal textile finishing practice, the difficulty arose of maintaining them in solution. Both compounds are soluble in strong caustic soda when added to the latter in the form of an aqueous alcoholic paste, but they separate out after dilution with water to an extent consistent with satisfactory dyeing practice. This poor solubility might, of course, have been predicted from the strongly hydrophobic nature of the fatty acid radicals. Strangely enough, however, this difficulty could not be overcome even with the aid of dispersing agents. Before abandoning this approach to the problem, it may be noted, the investigators obtained red insoluble dyes by coupling the aqueous alcoholic solutions of I and II with diazotised 2,5-dichloroaniline.

(b) The diamines used in the foregoing condensations were diazotised and coupled with naphthol A S. In the case of N-lauryl-*p*-phenylene diamine, a clear solution was readily obtained by diazotisation in the presence of diazopon A (a polyether alcohol preparation). The diazo body could thus be coupled, though slowly, on the fibre with naphthol A S. This produced a reddish-violet shade which turned red after hot soaping. The dyed fabric, it is encouraging to note, then possessed a full and soft handle, but the fastness to rubbing was by no means satisfactory. Diazotisation of N-stearyl-*p*-phenylene diamine was also carried out, but the diazo compound was altogether lacking in water solubility. As a matter of interest it may be noted that coupling in alcoholic alkali solution with naphthol A S gave a red dyestuff.

The July edition of the "Engineering Bulletin" issued by the MINISTRY OF LABOUR AND NATIONAL SERVICE is devoted to such problems as securing labour and training skilled workers. There are also many references to the vital rôle women are and can play in industry.

Ignition Temperatures of Acetylene Mixtures*

Acetylene-Air and Acetylene-Oxygen Mixtures Studied

by G. W. JONES and W. E. MILLER

A SURVEY of the literature relating to ignition temperatures of acetylene-air and acetylene-oxygen mixtures reveals rather wide disagreement in the reported results. In some instances the ignition temperatures of the air mixtures were reported to be lower than those of the oxygen mixtures, which is contrary to experience with other combustibles. To clear up some of the reported discrepancies, the authors have investigated the ignition temperatures of acetylene both in air and oxygen. The ignition temperature of a gaseous combustible mixture may be defined as that at which rapid combustion (usually indicated by a flame) becomes independent of external sources of heat. To obtain this condition, a given minimum volume of the mixture must be heated to a given minimum temperature for a given minimum time. Because of the many factors involved, ignition temperatures are not true physical constants, but are more correctly relative values obtained under certain experimental conditions and environment.

This report does not purpose to discuss the various factors that affect ignition temperatures. It can be stated, however, that results are affected by many variables, of which the most important are percentage of combustible in the mixture; oxygen concentration; "lag" or time required at a given temperature to cause ignition; size, composition, and dimensions of the apparatus in which the tests are made; pressure at which the mixture is confined at time of ignition; and presence or absence of catalysts

quartz bulb and necessary auxiliary equipment (see Fig. 1). A quartz bulb was used because of its minimum catalytic effects. One opening from the quartz bulb *f* was connected to a mercury reservoir *n* and the other to a high vacuum pump, *b*. A manometer, *d*, connected as shown, indicated the pressure in the bulb. Bulb *f* was surrounded by an electric furnace, *g*, which could be maintained at any desired temperature by regulation of the variable resistance, *l*. The temperatures were measured by a thermocouple and a potentiometer arrangement of standard type. The thermocouple junction was placed at the centre of the furnace outside the bulb and in contact with it. To promote equalisation of temperature throughout the furnace, a sheet of copper was placed around the bulb. This sheet formed a cylinder 9 in. long lying directly on the inside wall of the furnace, but did not touch the quartz bulb.

The acetylene-air or acetylene-oxygen mixtures for the tests were prepared in a mercury-sealed storage bottle *o* and carefully analysed on a Bone-Wheeler gas-analysis apparatus. Bulb *f* was then evacuated, and mercury was permitted to fill *n* by opening cock *m*. When mercury reached cock *m* it was closed. A sufficient quantity of the gas mixture in storage bottle *o* was passed into bell jar *n* to fill bulb *f* at atmospheric pressure yet leave enough gas in the bell jar to exert a pressure slightly above atmospheric. Bulb *f* was then evacuated to an absolute pressure of less than 1 mm.

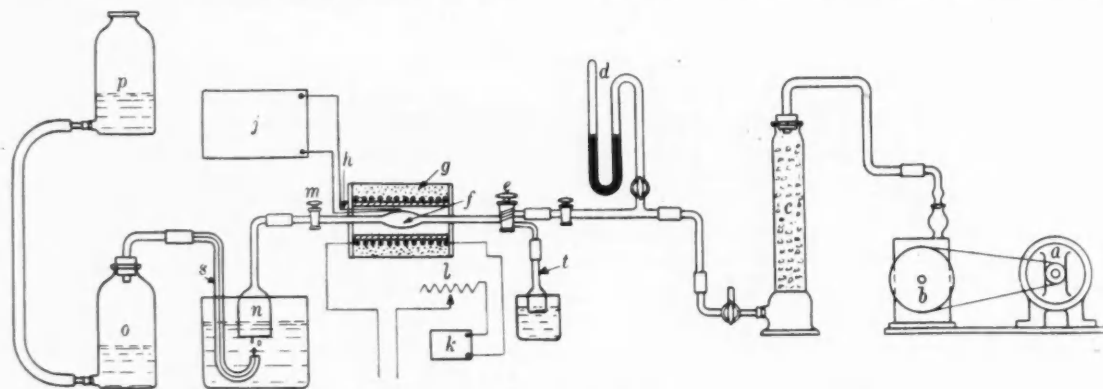


Fig. 1. Apparatus for determining relative ignition temperatures of gases

and impurities in the mixture. If the experimental equipment includes a rather large quartz bulb, which gives relatively low ignition temperatures, the results may be used safely in industry to determine the hazards that might result should such mixtures come into contact with heated materials.

Previous investigators have reported acetylene-air ignition temperatures ranging from 335° C., with a percentage of 40-50 per cent. acetylene by volume in a 375 c.c. bomb, to 500° C. with 10 per cent. acetylene under the same conditions. With acetylene-oxygen mixtures ignition temperatures of 350°-357° C. have been reported, using a 3 mm. concentric quartz tube (percentage of acetylene not stated), and 509°-515° C., using a glass bulb with 29 per cent. acetylene by volume.

The experimental apparatus used by the authors in the present investigation was similar to that employed by Mason and Wheeler (The Ignition of Gases; Part 4. *J. Chem. Soc.*, 1924, 125, p. 1869) and comprised a 131 c.c.

Hg and cock *e* closed. To test the mixture for ignitability cock *m* was opened, admitting the gas mixture to bulb *f* from *n*; cock *m* was immediately closed, and cock *e* was turned to connect to water seal *t*. The lag on ignition (if ignition took place) was measured by a stop watch from the instant the gas mixture was admitted to bulb *f*. Ignition of the mixture was indicated by a momentary drop in the surface level of the water in seal *t* and a visible flash in the quartz bulb. For a given mixture the mean of the lowest temperature that caused ignition and the highest that failed to do so was taken as the ignition temperature. All results were reproducible to within 1° to 4° C. At the conclusion of a test the bulb was evacuated, swept with nitrogen, and kept filled with this gas until the next test. Reproducible results could not be obtained unless the bulb was purged with nitrogen between each test. The nitrogen gas appears to bring the heated quartz surface to the same catalytic activity.

The table herewith gives the ignition of the mixtures tested and their average lags at the ignition point, and Fig. 2 is a graph of the results.

* Reprinted from U.S. Bureau of Mines Report of Investigations, No. 3567.

Acetylene, per cent.	In atmos- phere of	Average lag, seconds	Ignition temperature, ° C.
7.18	Air	2.0	470
9.75	do.	2.0	435
14.24	do.	2.6	380
22.62	do.	4.0	315
30.58	do.	5.6	305
37.05	do.	6.6	305
38.40	do.	5.4	305
52.00	do.	8.2	312
60.40	do.	4.4	310
68.00	do.	14.0	305
74.40	do.	11.6	305
91.10	Oxygen	8.0	306
86.70	do.	7.2	296
81.60	do.	6.5	296
70.70	do.	5.6	297

IGNITION TEMPERATURES OF ACETYLENE IN AIR AND OXYGEN.

It will be observed that the ignition temperature of acetylene in air is affected markedly by the percentage of acetylene in the mixtures. The higher the percentage of acetylene (up to about 30 per cent.) the lower the ignition temperature.

When the mixtures contained 30 per cent. or more acetylene (a condition under which insufficient oxygen was present to give theoretically complete combustion) the ignition temperature remained fairly constant at about 305° C. The lag at the ignition temperature increased with the concentration of acetylene in the mixtures.

Tests with acetylene-oxygen mixtures were confined to those having high concentrations of acetylene present, because of the great violence produced when the mixtures ignited within and near the range for theoretically complete combustion. Mixtures containing 70 to 91 per cent.

acetylene in oxygen had a minimum ignition temperature of 296° C. and were fairly constant throughout this range. An attempt was made to determine the ignition temperatures of mixtures containing less than 70 per cent. acetylene in oxygen, but the violence on ignition demolished the apparatus.

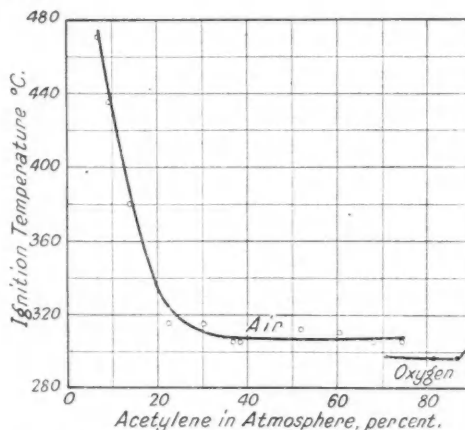


Fig. 2. Ignition temperatures of acetylene-air and acetylene-oxygen mixtures

The minimum ignition temperatures found for acetylene-air and acetylene-oxygen mixtures were lower than those reported previously in the literature, and the minimum ignition temperature of acetylene-oxygen mixtures was found to be 296° C., or 9° C. lower than the minimum for acetylene-air mixtures.

Oil and Colour Chemists

Annual Meeting of Association

THE annual meeting of the Oil and Colour Chemists' Association was held at the Russell Hotel, London, on July 17. Mr. W. E. Wornum, who was in the chair, was re-elected president and the other officers were re-elected as follows:—

Vice-presidents, Mr. H. Clayton, Mr. G. N. Hill, Dr. L. A. Jordan, Dr. G. L. Riddell, Mr. S. K. Thornley; hon. secretary, Mr. C. W. A. Mundy; hon. treasurer, Mr. H. D. Bradford; research and development officer, Dr. J. O. Cutter. Dr. G. F. New and Mr. S. Margison were nominated as members of council by the London and Manchester sections respectively, in place of Mr. D. E. Roe and Mr. F. J. Siddle, and Mr. J. Milligan was again nominated by the Scottish section. These nominations were accepted. Other members of council are Messrs. G. F. Jones, F. Sowerbutts, and D. Wait.

The council's annual report noted that the scheme for dividing the London area into regions, each with an hon. secretary empowered to call meetings, had not only overcome to a considerable extent the difficulty of holding wartime meetings, but revealed the possibilities of forming new sections in the south-west (Bristol), and the north-east (Newcastle-on-Tyne). It was stated that there were now 682 members. The balance in hand had increased by £75.

The President said it was the task of the Association to co-ordinate the views and the research of the various specialists in the industry in order that the whole might benefit. Since 1918, when the Association was formed, the oil and colour industry had become specialised, with resulting divergence. He urged the members to take a more active interest in the Association, pointing out that it could be of especial assistance to the younger members who wished to become research chemists. The council had appointed a committee under the chairmanship of Mr. G. A. Campbell (past-president) to consider this question in its widest sense.

Chemical Matters in Parliament

Scientific Advisory Committee

IN the House of Commons last week, Captain Plugge asked Sir John Anderson, Lord President of the Council, if the British Association of Chemists or the Institute of Chemistry had been consulted by the Scientific Advisory Committee on matters affecting chemists and what liaison was established between the committee and these and various other scientific and technical institutions.

Replying, Sir John Anderson said that special steps to consult representatives of the chemists were taken by the committee, although whether the two institutions mentioned had been consulted he could not say. Liaison with the numerous scientific and technical institutions maintained or assisted by the Government was established, however, through the secretaries of the Department of Scientific and Industrial Research, the Medical Research Council and the Agricultural Research Council, who were members of the committee, as well as through the directors of scientific research at the Admiralty, Ministry of Supply, Ministry of Aircraft Production and Ministry of Home Security. Liaison with other scientific institutions was maintained either through these official channels, or through the President and joint secretaries of the Royal Society, who were also members of the Committee.

The Columbia Chemical Division of the PITTSBURGH PLATE GLASS CO., 30 Rockefeller Plaza, New York, has spent many months in designing a suitable railway tank-car for the conveying of 50 per cent. or 73 per cent. liquid caustic soda, which, unless special measures are taken, crystallises in any insulated tank-car. This necessitates the expenditure of time and labour on steaming. The Columbia car, as it has become known, is of revolutionary design. It is an all-welded construction which eliminates many points of weakness, and is covered with a patent protective coating that withstands the high loading temperatures necessary if the caustic soda is to arrive in a liquid state.

Personal Notes

SIR EDWARD CROWE has been elected chairman of the council of the Royal Society of Arts in succession to Sir Atul Chatterjee.

DR. CLARENCE A. SEYLER, D.Sc., F.I.C., F.Inst.F., has been awarded the Melchett Medal by the Institute of Fuel in recognition of his research work on coal and its constitution.

MR. J. IVON GRAHAM, M.A., M.Sc., F.I.C., has been appointed assessor in the investigation of the causes of the explosion at the William Pit, Whitehaven Colliery, Cumberland, on June 3.

MR. W. M. SELVEY, Wh.Sc., A.R.C.Sc., M.Inst.C.E., M.I.Mech.E., M.I.E.E., F.Inst.F., has been elected President of the Institute of Fuel in succession to Lt.-Col. Sir John Greenly, K.C.M.G., C.B.E., F.Inst.F., as from October next.

SIR DAVID MILNE-WATSON, Bt., LL.D., F.Inst.F., has accepted the invitation of the committee of the Fuel Luncheon Club to be president of the Club for the coming session in succession to Lt.-Col. W. A. Bristow, M.I.E.E., F.Inst.F., who has been president for the past two years.

DR. HOWARD I. CRAMER, professor of rubber chemistry at the University of Akron, Colorado, and secretary of the Rubber Division of the American Chemical Society, has tendered his resignation to the University in order to join the research and development department of Sharples Chemicals, Inc., Philadelphia.

MR. ASHLEY S. WARD has been appointed chairman and managing director of Thomas W. Ward, Ltd., and also chairman of the Ketton Portland Cement Company. MR. GEORGE WOOD has been appointed deputy chairman and joint managing director of Thomas W. Ward, Ltd., and MR. ARNOLD CARR has also been appointed a director of that company, while MR. F. R. STAGG, who is assistant managing director of the company, has now been appointed deputy chairman and managing director of the Ketton Portland Cement Company.

At a meeting of the Society of Chemical Industry in London on July 8 the following were elected members: Mr. B. Atherton, Mr. H. R. Archer, Mr. C. L. Arcus, Mr. D. H. Bax, Mr. A. Bracher, Dr. V. C. E. Burnop, Mr. W. J. Carter, Mr. G. H. Cheesman, Mr. F. H. Cotton, Mr. G. A. Dawe, Mr. R. P. Donnelly, Mr. H. D. K. Drew, Mr. A. P. T. Easson, Mr. H. S. Foster, Mr. P. J. Fryer, Mr. J. F. A. Gerdes, Mr. A. S. Haigh, Mr. D. O. Jordan, Mr. D. G. Kerr, Mr. H. H. Light, Mr. J. D. Loudon, Mr. H. C. MacFarlane, Mr. L. Maddison, Mr. J. G. F. Miller, Mr. J. Milne, Mr. A. H. Mitchell, Mr. C. R. Morrison-Jones, Mr. R. H. Nicholson, Mr. A. S. Nickelson, Mr. B. H. Potter, Mr. D. Purdie, Miss J. D. Richardson, Mr. A. W. A. Rundle, Mr. G. Schaffer, Mr. G. H. Simmonds, Mr. T. B. Smith, Mr. H. W. Stern, Mr. W. S. Stevens, Mr. L. A. Wiseman, Mr. R. F. Wright, Mr. Hugh Graham, Mr. L. H. W. Savage.

Obituary

MR. J. RUTHERFORD HILL, O.B.E., who died recently aged 84, was, for over 50 years, resident secretary in Scotland of the Pharmaceutical Society of Great Britain, until 1936.

MR. JOHN LAWSON, aged 65, of Great North Road, Hatfield, Herts., who died on July 15, was for many years one of the principal representatives of Messrs. Duncan, Flockhart & Co., manufacturing chemists, London and Edinburgh.

LORD SUFFOLK, who has been posthumously awarded the George Cross "for conspicuous bravery in connection with bomb disposal," was, as already stated in these columns, killed by enemy action on May 12. Lord Suffolk, who took a B.Sc. degree in chemistry, with honours in pharmacology, at Edinburgh University in 1937, had done valuable work for war-time science as liaison officer between the Director of Scientific Research and French scientists until the collapse of France.

MR. RICHARD H. STEAD, of Widnes, who recently died at the age of 61, was formerly a chemist on the staff of the Broughton Copper Works, Ditton Junction, since taken over by I.C.I.

MRS. VIOLET THOMPSON, of East Beach, Lytham, whose death took place recently at the age of 50, was managing director of F. Thompson & Co., Ltd., chemical manufacturers, Manchester.

MR. CECIL ELDRED HUGHES, whose death on July 10, in his 66th year, we deeply regret to announce, was for many years a director of Benn Brothers, Limited, the proprietors of THE CHEMICAL AGE. From Eastbourne College he proceeded to University College, London, where he enjoyed the friendship of Mr. Wedgwood Benn. Thus began an association which had a major influence on his adult life, as he married Mr. Benn's sister, Margaret, and threw in his lot with his elder brother, Ernest, in whose publishing enterprises he took a prominent part for over 30 years. After leaving London University, he became private secretary to Sir Sidney Lee, who was then editor of the Dictionary of National Biography, and made several contributions to that monumental work, afterwards assisting Mr. C. B. Fry to edit the magazine bearing his name. He contributed various periodicals such as *The Globe* and, more particularly, *Punch*. His permanent connection with Benn Brothers began before the last war, in which he served with the R.A.F. in Egypt and Palestine, being twice mentioned in dispatches. During his long term with Benn Brothers, which continued up to the time of his death, he touched at one time or another the editorial activities of most of its publications. He was widely known as an art connoisseur, and this was the branch of publishing which he more particularly took under his wing. In an Italian garden forming a natural theatre at his home at Orpington, he and his wife produced year after year an open-air play in aid of the funds of the John Benn Hostel. He leaves a widow and two children, one of whom, Mr. Keon Hughes, followed him into the firm, of which he is now a director and publisher of the *British Trade Journal*.

An Industrial Leader

Death of Mr. H. J. Mitchell

MR. HAROLD JOHN MITCHELL, who died on July 22, aged 64, at Friston Downs, near Eastbourne, was president of Imperial Chemical Industries for two years until his retirement in 1938. He remained a director of the company up to the time of his death. Beginning as an office boy in the Nobel Dynamite Trust in 1893, he attained the position of secretary to the company in 1912. At the outbreak of the last war, when it became necessary to disentangle the British and German interests in the Trust, he was appointed liquidator. Difficult negotiations finally led to agreement; the Nobel Trust was re-organised as the Nobel Explosives Co., Ltd., with headquarters in Glasgow, where Mr. Mitchell went as assistant general manager. The immediate problem confronting the industry was to supply munitions, but it was quite clear that as soon as hostilities ceased the various companies would resume their competition with one another. Accordingly in 1918, again after devious negotiation, the explosives and ammunition concerns of Great Britain combined under the title of Explosives Trades, Ltd. This was later altered to Nobel Industries, Ltd. Lord McGowan (then Sir Harry McGowan) was appointed chairman and managing director and Mr. Mitchell became general manager. He joined the board of the company in 1920.

On the formation of I.C.I. in 1926 Mr. Mitchell was elected a director. His great experience, capacity for work, and executive ability were invaluable in the conducting of the affairs of the new company; Lord McGowan had one of the staunchest of helpers in Mr. Mitchell, whose death has broken a personal association of 40 years' standing. In 1936 he succeeded the late Marquess of Reading as president of I.C.I. He was hardly known to the general public, yet was one of the leaders of industry.

General News

The Governors of Salford Royal Technical College have received 26 applications for the post of head of the chemistry and applied chemistry department at the college. Six candidates have been chosen for interview.

Forewomen in the visual inspection shop of an I.C.I. factory have proved so successful, reports an official journal, that women charge hands are being introduced into other shops. They will gauge the accuracy of the setting, and have authority over men tool setters.

The china clay pit at Lee Moor, the largest in the world, and the Cholvichtown pit, about a mile distant, the closing of which about a year ago robbed almost the entire population of the Dartmoor villages of Lee Moor and Wotter of their livelihood, are not only again operating, but the demand for the clay is so great that the men are working ten hours a day. A third pit, that at Whitehall Yeo, is expected to re-open soon.

Foreign News

Plastics from carboic acid and from cellulose are now being produced in Shanghai by the Sheng Te Weaving Factory. Moulding powder is manufactured from imported phenol, formaldehyde, hexamine, and casein. Small quantities of casein are made from soya-bean curd at both Shanghai and Tientsin.

The opening of a plant to produce toluol, xylol, and other refined light oils in Nova Scotia is reported as one of the most recent developments of Canadian chemical activity. In 1940, the United States shipped to Canada 13,908,000 lb. of toluol, at a value of \$571,300, and 139,700 lb. of xylol, valued at \$6400.

Peppermint plants imported into Chile from Mitcham, Surrey, are said to have become completely acclimatised, and a drive is being made to extend their use so as to convert the present annual import of 3000-4000 litres of peppermint oil

From Week to Week

into an exportable surplus of 2000-3000 litres. Present Chilean production of the oil stands at some 500 litres per annum.

A new manganese concern, the Manganese Atacama S.A., has been organised, with government assistance, in Chile. The authorised capital is 4 million pesos. Exports of manganese from Chile in 1941, amounting to 4674 metric tons, were all directed to the United States; in 1940 the total was 19,518 tons, of which all but 210 tons (to Holland) likewise went to the U.S.A. In 1939, on the other hand, 7316 of the total export of 11,226 tons were absorbed by Germany.

Sales of liquefied petroleum gases to the American chemical industry showed an upward trend in 1940. Quoting figures in thousands of gallons, the Bureau of Mines records a rise from 26,890 (1939) to 34,603 as a total figure. Of the 1940 total, butane-propane mixtures accounted for 30,636, pentane for 3038, and propane for 987 thousand gallons, being respectively 25, 79 and 0.9 per cent. of the totals consumed. The aggregate chemical consumption represented 11.1 per cent. of the all-over total, compared with 12 per cent. in 1939.

Forthcoming Events

The 212th general meeting of the Society of Glass Technology will be held in the School of Art and Crafts, Stourbridge, Worcs., on July 30, at 10.30 a.m.

The London Section of the Oil and Colour Chemists' Association will hold a meeting on August 7, at 7 p.m., at the Federation of British Industries, 21 Tothill Street, S.W.1., when Mr. Sidney J. Johnstone, B.Sc., F.I.C., Principal of the Mineral Resources Department of the Imperial Institute, will give an illustrated lecture on "Minerals for the Paint Industry."

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

Froth flotation concentration of ores.—Minerals Separation, Ltd. (United States, Sept. 24, '40.) 7454.
Pre-treatment, etc., of waters.—Ocean Salts (Products), Ltd., W. E. Prytherch, J. H. Anderson and A. E. W. Lang. 7481.
Manufacture of oxaldehydes.—T. Reichstein. (Switzerland, June 17, '40.) 7489.
Treatment of percompounds.—H. Shaw and Imperial Chemical Industries, Ltd. 7479.
Production of synthetic resins.—Small and Parkes, Ltd., and C. A. Refarn. 7677.
Manufacture of sulphur trioxide.—Soc. of Chemical Industry in Basle. (Switzerland, June 15, '40.) 7488.
Tanks for liquids.—J. H. Sparshatt. 7712.
Method of regenerating a catalyst.—Standard Oil Development Co. (United States, June 15, '40.) 7617. (United States, July 16, '40.) (Cognate with 7617.) 7618.
Aqueous dispersions.—H. J. Tattersall, J. Munro and Imperial Chemical Industries, Ltd. 7604.
Utilisation of coal oil.—C. Weizmann. 7444.
Catalytic processes.—C. L. Wilson and Imperial Chemical Industries, Ltd. 7605.
Manufacture of dyestuffs and intermediates therefor.—N. H. Haddock and Imperial Chemical Industries, Ltd. 7603.
Manufacture of zircon refractories, etc.—H. W. K. Jennings (Titanium Alloy Manufacturing Co.). 7660.
Cleansing compositions.—Lever Bros. and Unilever, Ltd., and R. Thomas. 7598.
Method and apparatus for pumping volatile liquids.—Linde Air Products Co. (United States, June 15, '40.) 7588. (Cognate with 7588.) 7589, 7590, 7591, 7592. (United States, 18, '40.) (Cognate with 7588.) 7593.

Complete Specifications Accepted

Manufacture of soluble derivatives of acetylsalicylic acid.—G. M. Dyson and Genatosan, Ltd. Nov. 9, 1939. 537,112.

Containers for liquids.—L. Lasch and F. A. Hughes and Co., Ltd. Nov. 13, 1939. 537,260.

Copper base alloys.—A. H. Stevens (American Brass Co.). Dec. 1, 1939. 537,225.

Jaw crushers and crusher plates for jaw crushers and the like.—Nordberg Manufacturing Co. Dec. 12, 1938. 537,117.

Mineral oil compositions and processes of preparing the same.—A. H. Stevens (Armour and Co.). Dec. 7, 1939. 537,122.

Insecticidal compositions.—A. Abbey (Dow Chemical Co.). Dec. 7, 1939. 537,179.

Method of preparing colloidal silver iodide composition and the product.—A. C. Barnes Co., Ltd. Dec. 10, 1938. 537,127.

Compositions suitable for use in the preparation of insecticides, bactericides, and fungicides.—A. Abbey (Dow Chemical Co.). Dec. 11, 1939. 537,186.

Chemical heating pad.—United States Appliance Corporation. Dec. 27, 1938. 537,247.

Process for concentrating latices of rubber, guttapercha, balata and the like vegetable resins.—W. I. M. Holman and Revortex, Ltd. Jan. 3, 1940. (Cognate application 1397/40.) 537,132.

Plastic compositions.—Rubber Cement Products, Ltd., and R. H. P. Watts. Feb. 5, 1940. 537,135.

Method of manufacturing protein product, and products resulting therefrom.—Atlantic Research Associates, Inc. March 7, 1939. 537,149.

Cleaning compositions.—C. Roberson and Co., Ltd., and H. M. Ruhemann. March 13, 1940. 537,152.

Method of and means for adding lead to steel and other ferrous metals.—Inland Steel Co., and W. H. Broadfield. May 18, 1940. (Addition to 520,227.) 537,204.

Crusher plates for jaw crushers and the like.—Nordberg Manufacturing Co. Dec. 12, 1938. (Divided out of 537,117.) 537,289.

Process for the production of halogen substituted aminoaryl sulphonic acid derivatives, and the resulting products.—J. R. Geigy A.-G. Dec. 24, 1938. (Divided out of 536,901.) (Cognate application, 3869/41.) 537,173.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

EDWIN TAYLOR (CHEMICALS), LTD., Manchester. (M., 26/7/41.) July 1, series of £500 debentures, present issue £250; general charge.

FLEETWOOD CHEMICAL CO., LTD., London, S.E. (M., 26/7/41.) June 23, series of £2100 debentures, present issue £700; general charge. *£920. December 31, 1940.

Company Winding-Up Voluntarily

BROTHERTON (TAR PRODUCTS), LTD. (C.W.U.V., 26/7/41.) By special resolution, July 8. F. H. S. McDavid, of City Chambers, East Parade, Leeds, appointed liquidator.

Declaration of Solvency Filed

BROTHERTON (TAR PRODUCTS), LTD. (formerly Wear Fuel Works Co., Ltd.), Leeds. (D.S.F., 26/7/41.) June 30.

Satisfactions

A. & E. PEARS, LTD., Isleworth, soap manufacturers. (M.S., 26/7/41.) Satisfaction, June 30, £200 part of amount outstanding July 1, 1938.

VICTOR WOLF, LTD., Manchester, glycerine manufacturers. (M.S., 26/7/41.) Satisfaction, July 7, of debenture registered July 5, 1938.

Company News

Redfern's Rubber Works, Ltd., announce an interim dividend of 3½ per cent., less tax (same).

Cellacite and British Uralite, Ltd., have declared a profit of £20,295 for the year, and announce a final dividend of 10 per cent., making 25 per cent.

Hazell, Watson & Viney, Ltd., announce a profit for the year ended March 31, after depreciation and development reserve of £58,154 (£43,118), and have declared a dividend of 4 per cent., tax free (same).

Peter Brotherhood, Ltd., announce a profit for the year ended March 31, of £61,969 (£75,551), and as already stated in these columns have declared a final dividend of 12 per cent., making 20 per cent. (same).

Boots Pure Drug Company announce a record trading profit for the year ended March 31 of £1,001,370, less tax, making a net profit of £629,110 (£782,467). The dividend is unchanged at 21 per cent.

The Cape Asbestos Company have declared a profit for 1940 of £92,102 (£112,307), and recommend a dividend of 8½ per cent. on both the ordinary and preference shares, making 32½ per cent. (15 per cent.), on the ordinary and 17½ per cent. (20 per cent.), on the preference.

The directors of the Frickers Metal and Chemical Co., announce that all arrears of dividend on the preference capital are to be paid off, and they have declared a dividend of 12s. 9 3/5d. per share on the 8 per cent. cumulative preference shares, representing the fixed dividend for the year ended December 31, together with the outstanding arrears dating from December, 1932.

New Companies Registered

Products Development, Ltd. (368,236).—Private company. Capital, £2000 in 2000 shares of £1 each. Manufacturers, importers, exporters and brokers of and wholesale and retail dealers in chemicals, paints, varnishes, dyestuffs, etc. Subscribers: Fredk. Hopton; E. Rudland. Solicitors: Linklaters & Paines, Granite House, Cannon Street, E.C.

Lipton's Chemical Company, Ltd. (368,174).—Private company. Capital, £500 in 500 shares of £1 each. Manufacturers of and dealers in chemicals, disinfectants, perfumes, vermin and insect destroyers, soaps, oils, colours, fertilisers, etc. Directors: Leslie Lipton; Cecilia Lipton. Registered office: Unity Works, 31 Finchley Lane, N.W.4.

Beddow Sales, Ltd. (368,067).—Private company. Capital, £100 in 100 shares of £1 each. Manufacturers of and dealers in chemicals, cleaning materials, gypsum, disinfectants, fertilisers, oils, colours, glues, plastics, gums, pigments, varnishes, dyes, and chemical, photographic, laboratory and scientific equipment and apparatus, etc. Subscribers: John Van den Bok, 21 Holland Avenue, Cheam, Surrey; Charles W. Chivers.

Chemical and Allied Stocks and Shares

ALTHOUGH quiet conditions have obtained in Stock Exchange markets, where the disposition has been to await further developments in the war, the general undertone remained firm. Sentiment reflected the underlying strength of British Funds, and also the absence of any heavy selling. On the other hand, there was very little demand in evidence, and as a result, share values were slightly reactionary. Among industrial securities, the general tendency was affected to some extent by the full results of Boots Drug and the General Electric Company, which provide a striking indication of the large proportion of earnings absorbed in taxation. The directors of the G.E.C. point out that though the company had a very successful year's trading, provision for E.P.T. at 100 per cent., as against 60 per cent. in the previous year, was responsible for the reduction of £170,351 in net profits; as already announced, shareholders receive a distribution of 17½ per cent., compared with 20 per cent. previously. Owing to the weight of taxation, it may, of course, be prudent to expect moderately lower dividends from many companies playing an important part in the war effort. Nevertheless, the prevailing market view is that this is probably more than discounted in share prices, and that the latter may, therefore, be expected to show some response in the event of any general and sustained improvement in Stock Exchange values.

Owing to the surrounding market tendency in evidence at the time of writing, Imperial Chemical have moved back slightly to 31s. 9d., which compares with 32s. 3d. a week ago. I.C.I. 7 per cent. preference units at 32s. were also 6d. lower on balance. British Oxygen had an easier appearance at 66s. 3d., and Lever and Unilever reacted at one time, but later recovered to 25s., and were unchanged as compared with a week ago. On the other hand, awaiting the interim dividend announcement, Associated Cement remained firm at 55s. 7½d., and there was a fair amount of activity around 15s. 9d. in British Plaster Board 5s. shares. Hopes that the company's earnings may continue to be running at a better level were reflected by further improvement to 11s. 3d. in Imperial Smelting shares, while elsewhere, General Refractories made the higher price of 9s. 4½d. Moreover, rather more attention was given to Barry and Staines, which further improved to 30s. Nairn and Greenwich held their recent rise to 56s. 3d., and Fison Packard were again around 32s., while B. Laporte remained at 61s. At 71s. 3d. Turner and Newall were unchanged on balance for the week.

Although Allied Ironfounders improved further to 18s. 6d. there was an easier tendency in Guest Keen, United Steel and Consett Iron. On the other hand, Tube Investments, Stewarts and Lloyds and Staveley shares were inclined to improve, as were the shares of various other companies which are considered to have a reasonably satisfactory E.P.T. standard. Monsanto Chemicals 5½ per cent. preference were 22s. 6d., and Greiff Chemicals Holdings 5s. shares were quoted at par, but were inactive this week. United Glass Bottle ordinary remained firm at 52s. 6d. No change is generally expected to be made in the forthcoming interim dividend of the last-named company, and the prevailing view is that there are reasonable prospects of the total payment being kept at 12 per cent.; last year a dividend of over 21 per cent. was earned. Triplex Glass were also more active; results for the financial year ended last month may be issued towards the end of August. A number of dealings were recorded in Canning Town Glass, Forster's Glass and other glass shares.

Following publication of the full results, Boots Drug 5s. shares reacted slightly, but later rallied to 36s. 3d. The company's sales last year were at a "record" level and trading profits were higher, but owing to taxation and other special expenditure arising from the war, net profits work out at £629,110, compared with £782,467 in the previous year; the dividend is again 24 per cent., but on this occasion shareholders do not receive a special cash bonus. British Drug Houses were 22s. 9d., and elsewhere, Beecham's Pills deferred shares held their recent improvement. Most oil shares were lower on balance, the disposition being to await the forthcoming Anglo-Iranian dividend decision.

British Chemical Prices

Market Reports

STEADY to firm price conditions characterise nearly all sections of the market for general chemicals, and in some directions a higher tendency is noted. Taking the market as a whole the movement into consumption has been of fairly substantial dimensions, and the flow of delivery specifications has been on a steady scale. There is practically no change to report in the position of the potash products, and the demand in this section continues to be in excess of available supplies. A steady call is maintained for the majority of the soda products, and elsewhere an active trade is passing for acetic acid, tartaric acid, formaldehyde and acetone. There are no important price changes to record in the coal tar products market, and values in nearly all sections, with the possible exception of pitch, are firm. The demand for both crude and crystal carbolic acid continues strong; creosote oil, xylol and solvent naphtha, are all in active request with new spot transactions difficult to negotiate.

MANCHESTER.—Without showing much in the way of actual changes compared with the last report, there has been pronounced firmness of prices on the Manchester chemical market during the past week in most classes of "heavy" products, and the tendency is upward. Contract deliveries of the alkalis and the magnesium and ammonia compounds, as well as of the heavy acids, have been on steady lines, while fresh inquiry has been on a moderate scale. In the tar products market a fresh stiffening of quotations has been in evidence in cresylic acid, xylol and solvent naphtha, and also in refined tar, and a generally steady inquiry is reported.

GLASGOW.—In the Scottish heavy chemical trade day to day transactions continue, although, this week, business is quiet owing to the annual holidays. Export inquiries still remain limited. Prices generally remain firm with a further tendency to rise.

Price Changes

Alum.—Loose lump, £10 per ton, d/d, nominal.
Antimony Sulphide.—Golden, 11½d. to 2s. per lb. Crimson, 1s. 10d. to 2s. 2d. per lb.
Arsenic Sulphide.—Yellow, 1s. 10d. per lb.
Cadmium Sulphide.—5s. 9d. to 6s. 6d. per lb.

Carbon Black.—5½d. to 8½d. per lb., according to packing.
Cream of Tartar.—100%, 262s. per cwt., less 2½%, d/d, in sellers' returnable casks.

Creosote.—Home trade, 5½d. to 7d. per gal., f.o.r., makers' works; exports, 6d. to 6½d. per gal., according to grade.
MANCHESTER: 5½d. to 7½d. per gal.

Cresylic Acid.—Pale, 97/100%, 3s. per gal. **MANCHESTER**: Pale, 99/100%, 3s. 6d. per gal.

India Rubber Substitutes.—White, 5 15/16d. to 8½d. per lb.; dark, 5 9/16d. to 6 3/16d. per lb.

Naphtha.—**MANCHESTER**: 90/160°, 2s. 5d. to 2s. 9d. per gal.

Tartaric Acid.—**MANCHESTER**: 3s. 3d. per lb.

Xylol.—**MANCHESTER**: 3s. 4d. to 3s. 10d. per gal.

VISCOSITY OF BLAST FURNACE SLAGS

In studying the viscosity of the running slag at the Magnitogorsk blast furnaces, M. Osstrouchow, in *Stal*, reports that a special viscometer had to be designed for this purpose, as it was found impossible to measure the viscosity of Mn slags in graphic crucibles at 1400 and 1450 deg. From the measurements made, it is concluded that the fluidity and crystallisability of silica-alumina lime slags can be raised by adding magnesia or iron oxide. If both are added, the slag becomes more fluid and the crystallisation temperature is diminished by about 100 deg. The formation of a crust on the slag interferes with viscosity measurement.—*Iron and Coal Trades Review*, Vol. 143, No. 3829, p. 53.

ADAM HILGER, LTD., 98 St. Pancras Way, London, N.W.1, have published a new price list of their spectroscopically standardised substances for research purposes (H.S. and V.P.S. Brands). It is hardly necessary to remind our readers that the "H.S." scheme, started in 1923, provides the purest substances of the kind obtainable, each batch being numbered and provided with a full report, chemical and spectroscopic. The V.P.S. substances have been less fully investigated, but are also of exceptional high-purity standard.

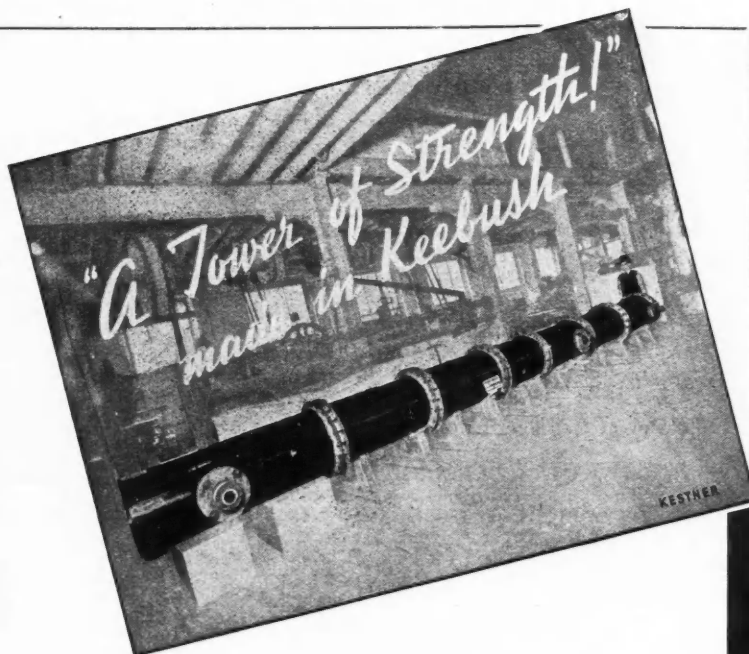


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Mild Steel Crumbling Barrel, 4 ft. 0 in. dia. by 3 ft. 8 in. long, mounted in cast iron cradle, phosphor bronze bearings, driven through machine cut gears from fast and loose pulleys.

New and Unused Totally Enclosed Cast Iron Mixer, 6 ft. 0 in. dia. by 2 ft. 10 in. deep, domed top, fitted man-holes, agitating gear, driven through machine cut worm wheel and pinion, fitted fast and loose pulleys.

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